

WHAT IS CLAIMED IS:

- 1           1. A high-density plasma process for depositing a layer of Silicon Nitride on a  
2 substrate in a plasma reactor, the process including the steps of:  
3           providing a gas including precursor components of the Silicon Nitride,  
4           generating a plasma applying a radio-frequency power to the gas, and  
5           the plasma reacting with the substrate to deposit the layer of Silicon Nitride,  
6           characterized in that  
7 the power applied to the gas is in the range from 2.5kW to 4kW.
- 1           2. The process according to claim 1, wherein the power applied to the gas is  
2 in the range from 2.9kW to 3.2kW.
- 1           3. The process according to claim 1, wherein the step of generating the  
2 plasma includes:  
3           applying a first radio-frequency power to the gas by means of a first power  
4 source, and  
5           applying a second radio-frequency power to the gas by means of a second  
6 power source, a ratio between the first power and the second power being in the  
7 range from 2.1 to 2.5.
- 1           4. The process according to claim 3, wherein the ratio between the first power  
2 and the second power is in the range from 2.2 to 2.4.
- 1           5. The process according to claim 1, wherein the step of providing the gas  
2 includes providing each precursor component at a flow rate in the range from 80% to  
3 95% of a corresponding rated value supported by the reactor.
- 1           6. The process according to claim 1, further including the step of cooling the  
2 substrate during the deposition of the layer of Silicon Nitride.
- 1           7. The process according to claim 1, further including the steps before the  
2 deposition of the layer of Silicon Nitride of:  
3           providing a further gas including Oxygen,  
4           generating a further plasma from the further gas, and  
5           heating up the substrate by means of the further plasma, thereby generating a  
6 first oxide liner on the substrate.

1           8. The process according to claim 7, wherein the step of generating the further  
2 plasma includes applying the radio-frequency power to the further gas, the radio-  
3 frequency power being not removed between the heating up of the substrate and the  
4 deposition of the layer of Silicon Nitride.

1           9. The process according to claim 7, further including the step of cooling a  
2 surface of the substrate that is not exposed to the further plasma during the heating  
3 up of the substrate.

1           10. The process according to claim 1, further including the steps after the  
2 deposition of the layer of Silicon Nitride of:  
3           providing a still further gas including Oxygen,  
4           generating a still further plasma from the still further gas to de-chuck the  
5 substrate from an electrostatic chuck, thereby generating a second oxide liner on the  
6 layer of Silicon Nitride.